REMARKS

In the Office Action, the Examiner noted that claims 1-17 are pending in the application and that claims 1-14 and 16-17 are rejected. The Examiner objected to claim 15. By this response, claims 1, 2, 7, and 16 are amended. In view of the above amendments and the following discussion, the Applicant submits that none of the claims now pending in the application are anticipated under the provisions of 35 U.S.C. §102, obvious under the provisions of 35 U.S.C. §103, or indefinite under the provisions of 35 U.S.C. §112. Thus, the Applicant believes that all of these claims are now in condition for allowance.

I. OBJECTIONS

The Examiner has objected to dependent claim 15 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. The Applicant thanks the Examiner for indicating allowable subject matter, but believes independent claim 14, from which claim 15 depends, is allowable over the prior art of record for the reasons set forth below. Thus, the Applicant contends that claim 15 should distinguish over the prior art of record since claim 15 depends from independent claim 14. Therefore, the Applicant respectfully requests that the objection to claim 15 be withdrawn.

II. REJECTION OF CLAIMS UNDER 35 U.S.C. §112

The Examiner rejected claims 16-17 as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention. Specifically, the Examiner stated that there is insufficient antecedent basis for the feature "the quantized I and Q correlations" in claim 16.

The Applicant has amended claim 16 to delete the term "quantized" from the phrase "the quantized I and Q correlations." The phrase "the I and Q correlations" has proper antecedent basis in claim 16. Thus, Applicants submit that claims 16-17, as they now stand, fully satisfy the requirements of 35 U.S.C. § 112.

III. REJECTION OF CLAIMS UNDER 35 U.S.C. §102

The Examiner rejected claims 1-3 and 7-9 as being anticipated by Harrison (United States patent 6,151,353, issued November 21, 2000). More specifically, the Examiner stated that Harrison describes a decimation circuit, a quantizer, and a convolution processor, as shown in the Applicant's independent claims 1 and 7. (Office Action, p. 2). The rejection is respectfully traversed.

Harrison generally describes a GPS receiver. (See Harrison, Abstract). With reference to FIG. 3, Harrison discloses an RF/IF tuner section (21) having an antenna (211), an RF amplifier (212), a mixer (213), a local oscillator (214), and a low pass filter (215). The low pass filter (215) provides a down-converted signal (i.e., an analog signal) to an analog-to-digital (A/D) converter (22). The A/D converter (22) samples the down-converted signal and supplies digital signal samples to a correlator (23). (Harrison, col. 9, lines 8-20; FIG. 3). The aspects of FIG. 3 described above are identical for each embodiment of GPS receiver disclosed in Harrison (Harrison, FIGs. 4 and 5).

Harrison, however, does not teach each and every element of the Applicant's invention recited in amended claim 1. Namely, Harrison does not teach or suggest a quantizer for producing quantized samples from subsampled signals, where the subsampled signals are produced by a decimation circuit in response to digital samples of received GPS signals. Specifically, the Applicant's amended claim 1 positively recites:

> "A receiver of global positioning system (GPS) signals comprising:
> a decimation circuit for producing a subsampled in-phase (I) signal and a subsampled quadrature (Q) signal from digital samples of received GPS signals;
> a quantizer for producing quantized I and Q samples from the subsampled I and Q signals;
> a convolution processor for producing I and Q correlations." (Emphasis added).

In the Applicant's invention, the decimation circuit processes digital samples of received GPS signals to produce subsampled signals, and the quantizer processes the subsampled signals to produce quantized samples. As such, the quantizer

advantageously reduces the number of bits-per-sample output by the decimation circuit to reduce complexity of the convolution processor. (See Applicant's specification, ¶81).

In contrast, Harrison describes a conventional front end for a GPS receiver, where an A/D converter generates digital samples from a down-converted analog signal. Whereas the A/D converter of Harrison produces digital samples from an analog signal, the quantizer recited in Applicant's claim 1 produces quantized samples from subsampled signals. That is, the quantizer of claim 1 operates on digital samples produced by the decimation circuit. Harrison is devoid of any teaching or suggestion of quantizing the digital samples after the samples are initially generated by the A/D converter. As such, Harrison does not teach or suggest a quantizer for producing quantized samples from subsampled signals.

"Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim." Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added). Since Harrison does not teach a quantizer for producing quantized samples from subsampled signals, where the subsampled signals are produced by a decimation circuit in response to digital samples of received GPS signals, Harrison does not teach each and every element of the Applicant's invention recited in claim 1. Therefore, the Applicant contends that claim 1 is not anticipated by Harrison and, as such, fully satisfies the requirements of 35 U.S.C. §102.

Amended claim 7 recites a method of receiving GPS signals having features similar to the features of claim 1 emphasized above. Thus, for the same reasons cited above, the Applicant contends that claim 7 is not anticipated by Harrison and fully satisfies the requirements of 35 U.S.C. §102. Finally, 2-3 and 8-9 depend, either directly or indirectly, from claims 1 and 7 and recite additional features therefor. Since Harrison does not anticipate the Applicant's invention as recited in claims 1 and 7, dependent claims 2-3 and 8-9 are also not anticipated and are allowable.

IV. REJECTION OF CLAIMS UNDER 35 U.S.C. §103

The Examiner rejected claims 4-6 and 10-14 as being unpatentable over Harrison. The rejection is respectfully traversed.

With respect to claims 4-6 and 10-12, the Examiner stated that the claimed subject matter are design specific and would have been obvious to one skilled in the art as an optional design choice. (Office Action, p. 3). With respect to claims 13 and 14, the Examiner conceded that Harrison does not teach reducing circuit complexity by presenting less bits-per-sample. (Office Action, p. 3). The Examiner concluded, however, that it would have been obvious to employ a divider for reducing the number of bits of precision in the receiver of Harrison. (Office Action, p. 3). The Applicant respectfully disagrees.

First, claims 4-6 and 10-12 depend from claims 1 and 7 and recite additional features therefor. Harrison does not teach, suggest, or otherwise render obvious the Applicant's invention as recited in claims 1 and 7. Namely, as discussed above, Harrison does not teach or suggest a quantizer for producing quantized samples from subsampled signals, where the subsampled signals are produced by a decimation circuit in response to digital samples of received GPS signals. Therefore, the Applicant contends that claims 4-6 and 10-12, which depend from claims 1 and 7, are patentable over Harrison and, as such, fully satisfy the requirements under 35 U.S.C. §103.

Second, Harrison does not teach, suggest, or otherwise render obvious the Applicant's invention as recited in claim 13. Namely, Harrison does not teach or suggest a divider for reducing the number of bits of precision of correlations generated by a convolution processor to produce quantized correlations. Specifically, the Applicant's claim 13 positively recites:

> "A receiver of global positioning system (GPS) signals comprising:
> a decimation circuit for producing a subsampled in-phase (I) signal and a subsampled quadrature (Q) signal from received GPS signals;
> a convolution processor for producing I and Q correlations;
> a divider for reducing the number of bits of precision of the I and Q correlations to produce quantized I and Q correlations;
> a signal normalizer for normalizing the quantized I and Q correlations to produce complex magnitude values; and
> a magnitude accumulator for summing the complex magnitude values."
> (Emphasis added).

In the Applicant's invention, the divider advantageously reduces the number of significant bits in the correlation results produced by the convolution processor before the correlation results are further processed (e.g., processed by the signal normalizer and the magnitude accumulator). (See Applicant's specification, ¶88).

In contrast, Harrison is completely devoid of any teaching or suggestion of employing a divider after the digital correlator for reducing the number of bits of precision in the correlations. Rather, in Harrison, the correlation results are directly coupled to the squarer (element 29 in FIGs. 3-5). While Harrison discusses the tradeoffs between memory requirements and signal-to-noise ratio with respect to use of a 1-bit and 2-bit A/D converter in the front end (col. 11, lines 30-55), Harrison is devoid of any discussion regarding a component for reducing the precision of correlation results produced by the digital correlator (element 23 in FIGs. 3-4). As such, Harrison does not teach or suggest a divider as recited in the Applicant's claim 13. Therefore, the Applicant contends that claim 13 is patentable over Harrison and, as such, fully satisfies the requirements under 35 U.S.C. §103.

Finally, Harrison does not teach, suggest, or otherwise render obvious the Applicant's invention as recited in claim 14. Namely, Harrison does not teach or suggest a magnitude approximation circuit for normalizing correlations generated by the convolution processor to produce complex magnitude values. Specifically, the Applicant's claim 14 positively recites:

> "A receiver of global positioning system (GPS) signals comprising:
> a decimation circuit for producing a subsampled in-phase (I) signal and a subsampled quadrature (Q) signal from received GPS signals;
> a convolution processor for producing I and Q correlations;
> a magnitude approximation circuit for normalizing the I and Q correlations to produce complex magnitude values; and
> a magnitude accumulator for summing the complex magnitude values."
> (Emphasis added).

The Applicant's invention as recited in claim 14 advantageously employs a magnitude approximation circuit to compute complex magnitude values, rather than a complex normalizer, in order to reduce circuit complexity.

In contrast, Harrison employs a squarer (element 29, FIGs. 3-5) that computes the square of a correlation result, rather than an approximation of the square of a correlation result. Harrison is devoid of any teaching or suggestion of employing a circuit or component for approximating the magnitude or square of correlation results produced by the digital correlator. As such, Harrison does not teach or suggest a magnitude approximation circuit as recited in the Applicant's claim 14. Therefore, the Applicant contends that claim 14 is patentable over Harrison and, as such, fully satisfies the requirements under 35 U.S.C. §103.

CONCLUSION

Thus, the Applicant submits that none of the claims presently in the application are anticipated under the provisions of 35 U.S.C. §102, obvious under the provisions of 35 U.S.C. § 103, or indefinite under the provisions of 35 U.S.C. §112. Consequently, the Applicant believes that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring any adverse final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Robert M. Brush, Esq. or Mr. Raymond R. Moser, Jr., Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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